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CONFERENCE ON ECOLOGICALLY SUSTAINABLE INDUSTRIAL DEVELOPMENT

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Contents

		Paragraphs	Page
Introduction		1 - 8	3
Agenda item 1:	Opening of the Conference	9	5
Agenda item 2:	Election of officers	10 - 11	5
Agenda item 3:	Adoption of the agenda	12	5
Agenda item 4:	Adoption of the rules of procedure	13	5
Agenda item 5:	Ecologically Sustainable Industrial Development	14 - 44	6
I.	Presentation of the themes	14 - 15	6
II.	Conclusions and recommendations	16 - 44	7
A.	General considerations	17 - 26	7
B.	Industry initiatives in achieving ESID	27 - 32	9
C.	Government initiatives in achieving ESID	33	11
D.	International cooperation in achieving ESID	34 - 39	12
E.	Future activities of UNIDO	40 - 44	13
Agenda item 6:	Reports from the symposiums	45 - 49	15
Agenda item 7:	Adoption of the report	50	16
Agenda item 8:	Closure of the Conference	51 - 53	16

Annexes

I. Reports of the technical symposiums 18

II. List of documents submitted to the Conference 33

Introduction

1. The Conference on Ecologically Sustainable Industrial Development organized by UNIDO was held at Copenhagen, Denmark, at ministerial level from 14 to 18 October 1991. The Conference was attended by representatives of Member States of UNIDO as well as intergovernmental organizations, industry and non-governmental organizations who participated as observers.

2. The objectives of the Conference were as follows:

(a) To clarify the issues related to ecologically sustainable industrial development (ESID) in all countries, particularly in developing countries, and the manner in which environmental concerns can be integrated into the ongoing industrialization process;

(b) To suggest some important roles for Governments, international organizations, industry, and non-governmental organizations in this regard;

(c) To suggest the role that UNIDO, in cooperation with other United Nations organs, organizations and programmes, could play in supporting such an effort, at both the policy and operational levels; and

(d) To provide an input on industry and the environment for consideration at the United Nations Conference on Environment and Development (UNCED) to be held at Rio de Janairo, Brazil, in June 1992.

3. The following countries were represented at the Conference:

Afghanistan, Algeria, Argentina, Austria, Bangladesh, Barbados, Belgium, Belize, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cameroon, Canada, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Czechoslovakia, Denmark, Dominican Republic, Ecuador, Egypt, Equatorial Guinea, Finland, France, Gambia, Germany, Ghana, Greece, Guatemala, Guinea, Haiti, Hungary, India, Indonesia, Iran (Islamic Republic of), Italy, Jamaica, Japan, Kenya, Lesotho, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Mauritius, Mexico, Morocco, Mozambique, Nepal, Netherlands, Norway, Papua New Guinea, Peru, Poland, Portugal, Qatar, Republic of Korea, Romania, Rwanda, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Sao Tome and Principe, Saudi Arabia, Senegal, Sierra Leone, Spain, Sudan, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Thailand, Togo, Tunisia, Turkey, Uganda, Ukraine, Union of Soviet Socialist Republics, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, United States of America, Venezuela, Yemen, Zambia, Zimbabwe.

4. Anguilla, Antigua and Barbuda, Australia and Holy See participated as observers.

5. The following organs and offices of the United Nations system were represented:

Department of Technical Cooperation and Development, International Trade Centre UNCTAD/GATT, United Nations Conference on Environment and Development, United Nations Centre for Science and Technology on Development, United Nations Centre for Transnational Corporations, United Nations Development Programme, United Nations Environment Programme, Economic Commission for Europe, Economic and Social Commission for Asia and the Pacific, Economic and Social Commission for Western Asia.

6. The following United Nations specialized and other agencies were represented:

International Labour Office, Food and Agriculture Organization of the United Nations, United Nations Educational, Scientific and Cultural Organization, World Health Organization, General Agreement on Tariffs and Trade.

7. The following other intergovernmental organizations were represented:

Commonwealth Secretariat, European Economic Community, Organization for Economic Cooperation and Development, Nordic Council of Ministers, Organization of Arab Petroleum Exporting Countries, Organization of Petroleum Exporting Countries, Centre for the Development of Industry of the EEC, International Institute for Applied Systems Analysis.

8. The meeting was also attended by representatives of the following non-governmental organizations:

Business Council for Sustainable Development, Centre for Science and Environment, Centre for the Development of Industry, European Confederation of Pulp and Paper and Board Industries, Conservation International, Danish Toxicology Centre, Development Horizons Trust, European Chemical Industry Council, Danish Society for the Conservation of Nature, Greenpeace International, Industriraadet, Institutraadet, Institute for European Environmental Policy, International Chamber of Commerce, International Confederation of Free Trade Unions, International Cooperative Alliance, International Council of Scientific Unions, International Fertilizer Industry Association, International Institute for Environment and Development, International Life Sciences Institute, International Network for Environmental Management, International Union of Architects, European Centre for Plastics in the Environment, International Youth and Students Movement for United Nations, Mazingira Institute, Vor Falles Fremtid, World Association of Industrial and Technological Research

Organizations, World Coal Institute, World Conservation Union, World Wide Fund for Nature, Umweltökonomische Studenteninitiative an der Hochschule St. Gallen.

The Conference was also attended by representatives of a large number of research groups and institutions, consultants and private companies.

Agenda item 1: Opening of the Conference

9. The Conference was formally opened by His Royal Highness, Crown Prince Frederik of Denmark. Inaugural statements were made by Anne Birgitte Lundholt, Minister for Industry and Energy of Denmark, and Domingo L. Siazon Jr., Director-General of UNIDO.

Agenda item 2: Election of officers

10. A. B. Lundholt, Minister for Industry and Energy of Denmark, was elected by acclamation to the office of President.

11. The following other members of the Bureau were elected by acclamation:

Vice-Presidents:	L. Alvarado (Chile)
	C. Forero Pineda (Colombia)
	M. Gerente (France)
	B. Botos (Hungary)
	N. R. Krishnan (India)
	H. Mahrou (Iran, Islamic Republic of)
	B. Baszczyk (Poland)
	J. A. Knauss (United States of America)
	M. Malianga (Zimbabwe)
Rapporteur-General:	C. Uteem (Mauritius)

B. D. Nielsen (Denmark) was appointed Secretary-General of the Conference.

Agenda item 3: Adoption of the agenda

12. The provisional agenda, as contained in document ID/WG.516/12, was adopted without amendments.

Agenda item 4: Adoption of the rules of procedure

13. The draft rules of procedure for the Conference, contained in document ID/WG.516/11, were adopted without dissent.

Agenda item 5: Ecologically Sustainable Industrial Development

I. Presentation of the themes

14. In the course of their work, the Ministers present at the Conference examined a wide variety of issues relating to ESID. It was agreed that all issues were closely interrelated and that particular attention should be given to the problems confronting the developing countries. The Ministers also noted with concern the particular environmental problems of countries in Central and Eastern Europe. The Ministers agreed that their conclusions and recommendations should lead to specific proposals for implementing a strategy at the national, regional and international levels and through UNIDO in support of ESID. They agreed to transmit their conclusions, recommendations and suggestions to the fourth session of the General Conference of UNIDO and recommended that those conclusions, recommendations and suggestions should also form the basis of the contribution of UNIDO to the United Nations Conference on Environment and Development (UNCED), to be held at Rio de Janeiro, Brazil, in June 1992.

15. Discussion at the Conference was focused on three major themes, each of which was introduced by keynote speakers representing the various categories of participants:

(a) The road to ecologically sustainable industrial development and barriers facing the achievement of ecologically sustainable industrial development

Introductory statements were made by the Director-General of Colciencias (Colombia), the Executive Secretary of the Economic Commission for Europe, the Executive Director of the Business Council for Sustainable Development and the Executive Director of the International Institute for Environment and Development.

(b) Government and industry initiatives in achieving ecologically sustainable industrial development

The debate on initiatives by government and industry in achieving ESID was introduced by the Minister of Environment of Czechoslovakia. Introductory statements were made by the Executive Director of the United Nations Centre on Transnational Corporations, the Secretary-General of the International Chamber of Commerce and the Chairman of the Centre on Science and Environment.

(c) International co-operation in achieving ecologically sustainable industrial development and the role of UNIDO

The debate on international co-operation in achieving ESID was introduced by the Under-Secretary of Commerce of the United States of America, the Head of Pollution Control Division in the Environment Directorate of the Organization for Economic Co-operation and Development, the Executive Director of the Mazingira Institute (Kenya), and the Secretary-General of the Second World Industry Conference on Environmental Management. The debate was closed with a statement

by the Secretary-General of the United Nations Conference on Environment and Development. General statements pertaining to the work of the ESID Conference were made by the representatives of two NGOs, namely Vor Falles Fremtid and the International Fertilizer Industry Association.

II. Conclusions and recommendations

16. The conclusions and recommendations adopted by the Conference are contained in paragraphs 17 to 44 below.

A. GENERAL CONSIDERATIONS

17. The Ministers noted with concern that, although successes had occurred in the 1970s, the gap between developed and developing countries in terms of per capita income and per capita industrial output narrowed slightly between 1970 and 1990. Industrialization, the well-trodden path to the achievement of higher standards of living and expanded economic development, remained a distant goal for many developing countries.

18. The Ministers noted that threats to the environment were a common concern. They stated that all countries should take effective action to protect and enhance the environment in accordance with their responsibilities and respective capacities. In this regard, the Ministers confirmed that in developing strategies to secure agreement on, and commitments by, Governments on major environmental issues, it has been recognized that:

(a) Because the greater part of current emission of pollution into the environment originates in developed countries, these countries bear the main responsibility for combating such pollution;

(b) International cooperation between all countries, and in particular between developed and developing countries, is essential to acquiring and using relevant scientific information and environmentally sound technologies. Industrialized countries with significant experience in pollution prevention, cleaner production methods and pollution control technologies are encouraged to promote industrial pollution prevention and management world wide. Economic well-being is essential for achieving sustainable development and minimizing the degradation of the environment concomitant with such growth. Ministers called on Governments and industry to cooperate at the local, national and regional levels in using existing and, where necessary, establishing new mechanisms that promote pollution prevention, waste minimization, cleaner production, energy efficiency and rational use of natural resources and in making these techniques and technologies available, particularly to developing countries. This would entail the mobilization of financial resources and enhanced technical cooperation in particular with developing countries, at the bilateral and multilateral levels. However, it was also recognized that new and additional financial resources will have to be channelled to developing countries in order to ensure their full participation in global efforts for environmental protection.

19. Ministers recognized that economic, social and environmental elements of the decision-making process should be fully integrated, and that there was a fundamental mutual dependence between economic growth and environmental protection. Ministers noted that sustained economic growth and effective environmental protection are closely interlinked and should not be looked upon as competitive policy objectives.

20. The continuing deterioration of the global environment is closely related to the unsustainable pattern of production and consumption in particular in industrialized countries In developing countries, environmental degradation is closely related to poverty and underdevelopment, as well as demographic patterns and pressures. Promotion of economic and social development is therefore essential for the protection of the environment.

21. The Ministers noted with concern the financial and technological constraints facing the developing countries in realizing the desired ecologically sustainable industrial development.

22. The Conference was held at the time when economic reforms to strengthen the private sector and harness market forces in support of economic development were being carried out in a number of countries. The need was recognized for economic instruments to supplement public regulations. Ministers stressed that market-oriented instruments could play an increasing role in achieving ESID, in particular by internalizing environment considerations. Assistance should be provided upon request, by donors and international organizations, to countries that needed to develop such instruments and to administer them.

23. The Ministers called for new approaches to industrialization that would allow industry to contribute to economic and social benefits for present generations without compromising the ability of future generations to meet their own needs, and without impairing basic ecological processes. These new approaches do not imply in any way encroachment upon national sovereignty. States have, in accordance with the Charter of the United Nations and the applicable principles of international law, the sovereign right to exploit their own resources pursuant to their environmental policies. This also reaffirms their responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States. Those new approaches would enhance economic development over time through the efficient and rational management of both renewable and non-renewable resources while aiming at minimizing waste. They would differ from country to country, depending on the resource endowments, the stage of development and other economic and social characteristics as well as the assimilative capacity of the ecosystem.

24. The Ministers agreed that the reduction of pollution intensity across all media within industry, through cleaner production, was the key to achieving ESID. Thus, the development of technology to promote cleaner production should be enhanced. The objective of cleaner production, with its focus on source reduction, waste minimization, energy efficiency and low-waste and non-waste technology, is to prevent or minimize, in the most cost-efficient manner, the short- and long-term risks to humans and the environment. Cleaner production would require a management approach that, inter alia:

(a) Assigned priority to the efficient use of resources, materials substitution and product reformulation, process modification and equipment redesign to lower waste technologies, and recycling and reuse as the primary options for pollution prevention and increased profitability;

(b) Utilized safe and environmentally sound processes, technologies and substances combined with efficient operating procedures;

(c) Assigned clear responsibility and incentives for pollution prevention and control, in the context of a regulatory framework that establishes achievable environmental goals and that provides industry with flexibility in the choice of response actions.

25. Ministers recognized the importance of providing women with knowledge on ESID, as well as access to the necessary measures to promote it.

26. The Ministers agreed to support action to overcome barriers to the achievement of ESID. Among those barriers are the difficulties of implementing policies both in the North and the South that would bring about a transition to ESID. Industry everywhere needed to re-examine its attitudes on pollution prevention, cleaner production and environmentally friendly products.

B. INDUSTRY INITIATIVES IN ACHIEVING ESID

27. The Ministers recognized that industry and industrial institutions had to play a central role in the transition to ESID. While Governments can assist, regulate and control that transition, it is essential that industry acts in accordance with the principles implied by ESID. The relevant organizations and institutions should promote managerial practices and technologies based on the principles of sustainability.

28. The Ministers agreed that, in order to achieve ESID, industry initiatives should include the following objectives.

(a) Adoption of pollution prevention, the approach that prevents pollution at the source in products and manufacturing processes rather than removing it after it has been created;

(b) Integration of environmental awareness and responsibility at all management levels, taking into account careful analysis of relative risks, introduction of waste minimization and environmental compliance auditing, establishment of emergency, risk and safety management systems, as well as training programmes;

(c) Adherence to environmental codes of conduct, including voluntary ones, for industrial investment and production;

(d) Increase of R and D activities with emphasis on cleaner production technologies, giving priority to technologies that offer potential for improved efficiency and reduced pollution; and provide training facilities to developing countries for this purpose;

(e) Consideration, where feasible, of the use of substitute materials and product reformulations, process modifications and equipment redesigns, renewable sources of energy and raw materials, recycling and reuse of waste and scrap materials;

(f) Assumption of a "cradle-to-grave" assessment approach to industrial products and projects;

(g) Application of cleaner industrial production processes and more rational use of natural resources;

(h) Development, transfer and adaptation of environmentally sound technologies, know-how and skills to meet the needs of other countries, in particular developing countries, and mobilization of financial resources and provision of human resources for this purpose;

(i) Encouragement of industry to provide information on environmentally sound management and energy conservation.

The foregoing objectives could be facilitated by regular exchanges of experiences in the context of long-term programmes developed by industry.

29. The Ministers recognized that the Economic and Social Council, at its second regular session of 1991, had addressed ways to encourage and mobilize industrial enterprises, including transnational corporations, to cooperate in efforts to protect and enhance the environment in all countries. In that regard, the Council adopted resolution E/1991/55, requesting, inter alia, the preparation of action-oriented and practicable recommendations for consideration by the Commission on Transnational Corporations and by the Preparatory Committee of the United Nations Conference on Environment and Development.

30. The Ministers recognized that many transnational companies and investors involved in international joint ventures or in the export of manufacturing processes implement ESID and apply general standards of environmental responsibility to their foreign operations which are fully consistent with those used in their home countries and in compliance with the laws and regulations of host countries. These standards should not be applied on a discriminatory basis. Ministers encouraged all companies to adopt this policy and subscribe to a rational and precautionary approach to anticipating and preventing the causes of serious or irreversible environmental degradation consistent with scientific and technical understanding and the economical use of resources.

31. The Ministers encouraged non-governmental organizations representing all the parties involved in the industrial process, including industrial federations, trade unions, and consumers and environmental groups, to carry out and participate in activities relevant to ESID.

32. UNIDO undertook five case studies for the preparation of the Conference to illustrate the scope for ESID. These case studies covered pulp and paper, leather industry, alumina industry, plastics and plastics waste recycling, and phosphate fertilizers. The studies

presented a number of problems related to unsustainable production processes and suggested measures to solve them. Ministers emphasized the importance of ensuring close cooperation between industry, Governments and international organizations in solving those problems.

C. GOVERNMENT INITIATIVES IN ACHIEVING ESID

33. The Ministers agreed that Governments could:

(a) Review the environmental impact of current and planned policies, regulations and institutional infrastructure that affect industry and environment with a view to contributing to the transition to ESID through appropriate policies and measures;

(b) Review the environmental impact of current and planned policies and build in the environmental concerns as an integrated part in such policies and strategies;

(c) Design suitable methods and tools for quantification and valuation of natural and environmental resources used by industry;

(d) Establish new, or strengthen existing procedures for reviewing industrial projects with potentially significant environmental effects. Similar procedures should be applied for reviewing risks associated with products. The evaluation and assessment procedures should be based on a cradle-to-grave approach and continue during and after completion of projects. The evaluation and assessment procedures should be supported by internationally recognized ecological guidelines and indicators where these exist;

(e) Apply, with due consideration for the economic and social conditions in specific countries, a balanced mix of regulatory and economic instruments, including the internalization of externalities in price calculations, to reach the objectives of industrial development and environmental protection;

(f) Design policies based on the "polluter pays" principle, bearing in mind the need to internalize the cost of environment protection in price calculations, and to apply a precautionary approach and the principle of economic efficiency when undertaking or promoting investments. Inclusion of the cost for pollution abatement in entrepreneurial calculations would thus be a useful approach governing the use of economic instruments and help to achieve a better allocation of resources in the pursuit of environmentally sustainable industrial development;

(g) Implement schemes for increasing public awareness, particularly in the younger generation, of the necessity for ESID and the responsibility of individual enterprises, managers, engineers, workers and other members of staff in that respect;

(h) Give active encouragement to ESID through research, development, acquisition and transfer of techniques and technologies, as well as efficient utilization of existing relevant technologies in the

public and private sectors, and through public and private partnerships while ensuring occupational health and safety;

(i) Promote technical and managerial training and education that incorporate ESID in both informal and formal sectors;

(j) Create an adequate institutional framework to stimulate environmental policies such as regulations, standardization, monitoring and control of the industrial environment;

(k) Promote ESID through environmental education and the participation by the general public and non-governmental organizations, such as industrial federations, employees associations, community-based groups, consumers, women's, environmental and developmental organizations;

(l) Support exchanges of information and experience on ESID among all countries in particular between industrialized and developing countries;

(m) Provide access, on preferential conditions, to financing sources to small- and medium-scale enterprises in support of ESID-oriented restructuring and modernization;

(n) Incorporate the principal elements of their policy in programmes that extend over several years. These programmes should be made public.

D. INTERNATIONAL COOPERATION IN ACHIEVING ESID

34. The Ministers called upon Governments to enhance international cooperation in mobilizing financial resources for achieving ESID. The mobilization of financial resources is of vital importance to ESID, as well as to alleviating environmental problems in general. International sources of financing, particularly the development assistance programmes of developed countries, play a key role in this respect.

35. Noting that the transfer of techniques and technologies is one of the keys to the adaptation and absorption of pollution prevention techniques and the cleaner production processes by industrial firms, the Ministers agreed to encourage international cooperation in the transfer of those techniques, technologies and processes, and the requisite information, skills and know-how from industrialized to other countries, in particular developing countries, as well as the means necessary to develop infrastructure and policies to support them. The Ministers recalled United Nations General Assembly resolution 44/228, section I, paragraph 15 (m), which decided that UNCED should have as an objective the examining of effective modalities for favourable access to, and transfer of, environmentally sound technologies, in particular to the developing countries, including on concessional and preferential terms. The Ministers look forward to the results of that examination.

36. The Ministers invited Governments to seek international cooperation in addressing concerns about linkages between the environment and trade in manufactured goods. While the pursuit of the objectives of trade liberalization and environmental protection are in principle compatible, some trade practices may give rise to certain environmental concerns, and some environmental actions may adversely affect international trade flows. The Ministers also noted that improved access to markets in general - through reduction and possible elimination of tariffs and elimination of non-tariff barriers to trade - would improve the possibilities of all countries, particularly of developing countries, to finance the introduction of ESID-related technologies, and could have important foreign exchange implications.

37. Noting that financial and technological constraints are among the key obstacles facing many countries, in particular developing countries, in achieving ESID, the Ministers acknowledged that the industrialized countries should create a climate conducive to enabling those countries to have access to appropriate ESID techniques and technologies and to financial resources on concessional and non-concessional terms, as appropriate.

38. Ministers called for the need to coordinate efforts between UNIDO and all other United Nations institutions and organizations that deal with environmental issues, in order to be more efficient and effective, and avoid duplication in the pursuit of ESID.

39. Ministers recognized the critical situation prevailing in least developed countries and called for special measures in favour of those countries in support of their ESID policies and programmes.

E. FUTURE ACTIVITIES OF UNIDO

40. Ministers recognized that ESID can both reduce environmental problems and enhance industrial efficiency, and invited the fourth session of the General Conference of UNIDO to express its support for UNIDO to continue working on the best options to achieve ESID, in order to present them as a valuable contribution to be taken into account at the Fourth Preparatory Committee of the United Nations Conference on Environment and Development, which will take place in March 1992, and for submission at the UNCED conference in June 1992.

41. Ministers invited UNIDO to submit proposals incorporating the views expressed at the meeting in Copenhagen, and to make concrete suggestions to harmonize its activities, in the short, medium and long term, with the concept of ESID. These suggestions should be submitted for consideration to the policy-making bodies of the Organization, taking into account the mandates, recommendations and guidelines of UNCED. In order to improve UNIDO's capabilities to implement the conclusions and recommendations of the ESID Conference, the Ministers further call upon Member countries to continue to make resources available for sustainable industrial development through the UNIDO Environment Programme.

42. Action by UNIDO, within available regular budget resources and additional voluntary contributions, if any, could make a significant contribution to the implementation of ESID. Because environmental management often involves complex issues and requires specialized skills, UNIDO would need to work in cooperation with other organs, organizations and programmes of the United Nations system to ensure the broadest possible effort. In particular, UNIDO should work closely with the United Nations Environment Programme, especially with its Industry and Environment Office, in such activities as information exchange and training.

43. UNIDO should lend its support, on a coordinated basis, to the activities of other organizations active in this field, in particular United Nations regional commissions, in implementing ESID at the regional level. Further, UNIDO should promote the establishment and support of the necessary institutional framework and should work in close cooperation with national institutions in implementing ESID.

44. The following were some major directions for possible UNIDO action in achieving ESID:

(a) Assisting developing countries, upon request, in building the technical and scientific institutional capacity to develop, absorb and diffuse pollution prevention techniques and cleaner production processes essential to making the transition to ESID. This could be done by:

(i) Demonstrating the financial and economic advantages and environmental benefits of ESID by working cooperatively with industry and other technical experts, and with Governments, to undertake a programme of site-specific, country case studies;

(ii) Providing technical support for the design, establishment, operation, evaluation and monitoring of pollution prevention techniques and cleaner production processes and technologies;

(iii) Assisting demonstration and training centres at new or existing industrial facilities, and providing support to centres of excellence;

(b) Assisting developing countries in the implementation of international environmental conventions and protocols related to industrial activities by:

(i) Providing technical assistance to those countries to identify and implement the actions needed;

(ii) Helping those countries to locate expertise and funding for projects that contribute to the implementation of those conventions and protocols;

(c) Assisting developing countries in determining the environmental soundness of industrial technologies by:

(i) Preparing guidelines on environmentally sound industrial practice for selected sectors;

(ii) Promoting, in selected sectors, technical procedures to evaluate and to test processes, products and services;

(iii) Providing assistance for the development of assessment techniques for the identification and measurement of environmental impact;

(d) Assisting developing countries in integrating environmental considerations into their industrial strategies and policies by:

(i) Identifying sectoral and subsectoral priorities for environmentally sound industrial activities;

(ii) Specifying the techniques available to rehabilitate existing industries so that they could operate in an ecologically sustainable manner, assessing the costs of such a transition and estimating a time-frame for achieving it;

(e) Assisting developing countries in identifying appropriate, including new, financial resources, where possible on concessional terms, that would enable them to take necessary steps to achieve ESID;

(f) Assisting other countries, upon request, in achieving ESID in accordance with the provisions of the UNIDO Constitution and relevant decisions of the General Conference and Industrial Development Board;

(g) Strengthening its existing database and its capacity to coordinate the dissemination of technical and policy information on ESID, inter alia, by cooperating with the United Nations Environment Programme in its work on the International Cleaner Production Clearinghouse (ICPIC).

In implementing its programmes and projects UNIDO should establish and/or strengthen internal procedures for appraisal and approval of activities that ensure compatibility with the concept of ESID.

Agenda item 6: Reports from the symposiums

45. Drawing on the case studies referred to in paragraph 32 above, the Ministers took note with appreciation of the conclusions formulated during a series of technical symposiums that were held concurrently with the plenary meetings of the Conference. Those conclusions are listed below. The technical symposiums covered five industrial subsectors - alumina, leather, phosphate fertilizers, plastics and plastics waste recycling, and pulp and paper. Discussion in the symposiums reflected the issue of ecologically sustainable industrial development addressed in the plenary. Specific examples were provided of the implications of ESID for each subsector.

46. Each symposium was led by a panel consisting of a UNIDO sectoral expert, an independent international expert and a representative of industry. An NGO representative participated in the panels of the five symposiums. The moderator of each panel was a representative of an IGO. After the initial presentations, detailed discussions took place on the specific problems, and their possible solutions, in addressing the tenets of ESID.

47. The five symposiums arrived at various conclusions relevant to the sectors covered. One such conclusion pertained to the need for subsector-specific technical cooperation efforts, the exchange of information and, in some cases, support of significant research efforts, in order to assist those subsectors in developing countries to meet ESID requirements. A second conclusion was that ESID could be supported by both short-term, low-cost adjustments as well as by longer-term, higher-cost solutions offered by newer technologies. A third conclusion was that meeting ESID requirements would neccessitate some structural changes affecting the subsector as a whole, as well as measures to reduce specific pollutants from individual industrial plants. Examples of such structural changes were: recycling in the pulp and paper, plastics and aluminium industries; provision of alternative processes to the leather tanning industry; and changes in agricultural practices to reduce the need for fertilizers. A fourth conclusion was that industry bears a major responsibility for the cradle-to-grave management of its products, including support for the above-mentioned structural changes.

48. It was agreed by participants that the exchange of views in the individual symposiums, in addition to clarifying the issues relating to ecologically sustainable industrial development for the specific subsectors, had suggested important roles for different actors. The discussion also highlighted a number of ways in which UNIDO, based on its accumulated experience, could support such efforts at both the policy, informational and operational levels.

49. More detailed coverage of the results of the symposiums is contained in annex I to the present report.

Agenda item 7: Adoption of the report

50. The report of the Conference was presented by the Vice-President, Mr. M. Malianga (Zimbabwe) on behalf of the Rapporteur, and was adopted at the final plenary session with the understanding that the Secretariat was authorized to finalize it in the light of amendments.

Agenda item 8: Closure of the Conference

51. The Ministers expressed their appreciation to the Government of Denmark for its hospitality and cooperation in facilitating the work of the Conference. In this connection, the Ministers noted with appreciation the contributions by those countries who, through the Industrial Development Fund, made it possible to convene the Conference.

52. Statements of appreciation were made by the representatives of Argentina, India, Mexico, Turkey, Uganda, United Republic of Tanzania, United States of America and by the representative of Vor Falles Fremtid, on behalf of the NGOs attending the Conference.

53. The meeting was closed at 12 noon, 18 October 1991.

Annex I

REPORTS OF TECHNICAL SYMPOSIUMS

Contents

		Page
I.	Alumina industry	18
II.	Leather industry	20
III.	Phosphate fertilizers	23
IV.	Plastics and plastics waste recycling	27
V.	Pulp and paper	29

I. ALUMINA INDUSTRY

1. The Symposium was held on 15 October 1991. Members of the Panel were P. Siklosi (Consultant), F. Balkau (Moderator) UNEP/IEO, T. Grof (Rapporteur) UNIDO, F. Panzeri (Industry representative) Italy, and R. Luken, UNIDO Secretariat. Ms. Taschner from the European Environmental Bureau made an intervention from the floor on behalf of NGOs.

2. Mr. Siklosi briefly summarized the case study and highlighted the main environmental issues now confronting the alumina industry. These include pollution, waste disposal, energy, occupational health and safety.

A. Introduction

3. Bauxite mining causes unavoidable ecological disturbance, and in some circumstances the issue of preservation of biodiversity is important.

4. Industry has numerous options for addressing environmental issues. Many of these are based on reducing in-plant losses and are achieved by a general improvement in operating efficiency, thus achieving both economic and environmental goals simultaneously. Some measures, however, especially those concerning mine rehabilitation and waste disposal, will entail an additional non- recoverable cost. Total costing procedures and harmonization of environmental requirements are needed to encourage the uniform application of all environmental measures.

5. Traditional environmental issues of pollution and waste disposal are generally well appreciated by the industry. Consciousness of energy consumption as a major issue confronting the sector is also rising, and many initiatives are being undertaken to reduce energy consumption.

6. A number of specific technical questions were raised during discussion about such issues as caustic soda recovery, construction of red mud disposal basins, and use of red mud as a soil conditioner or even as artificial soil.

B. Recommendations

7. Industry experts summarized the most promising ways of reducing the negative environmental impact of the alumina industry at the plant level as follows:

(a) Reduction of the amount of natural resources (primarily energy) consumed per unit amount of alumina manufactured;

(b) Reduction of the residual discharges (effluents, dust, stack gases) per unit amount of alumina manufactured;

(c) Environmentally sustainable discharge and storage of digestion residue (dry stacking of red mud), recultivation of the filled-up storage areas.

8. The above can be realized by:

(a) Better operational and maintenance practices (e.g.preventing leakages, proper heat insulation, maintaining the prescribed parameters of the process, etc.);

(b) Economically reasonable measures for efficient resource utilization, pollution control and waste disposal (e.g. increasing the number and size of heat exchangers, washing stages, etc.);

(c) Measures necessary to meet environmental requirements conforming with the generic ESID norms (e.g. installing dust collectors, scrubbers, dust filters, red mud filters or deep thickeners, recultivating mined-out areas and filled-up mud disposal areas, etc.) even if costly.

9. In general, it can be said that whereas modifications to existing old plants are relatively costly (they may reach even 30 to 50 per cent of the original investment costs), those incorporated in the engineering designs of a new plant (or of a significant expansion of an existing one) do not increase the capital costs by more than 5 to 10 per cent. At the same time the latter usually enable such savings to be made (both in related investment and operating costs) that they can make the application of environmentally sustainable solutions profitable.

10. As a general rule, it was agreed that sound methods of operation and of waste disposal do exist, but that they are not always applied due to lack of information, expertise or capital.

C. Discussion

11. During discussion, delegates raised the importance of broader issues which affect the industry as a whole. These broader issues include:

(a) Promotion of recycling as a means of reducing energy and resource demand, both of which have unavoidable environmental impact;

(b) Application of total life-cycle con- siderations within the industry so as to minimize overall environmental impact, and to avoid shifting environmental impact between different sectors;

(c) Possibility of increased residue and waste utilization outside the plant so as to reduce the need for disposal. There are already many useful re-use options; nevertheless, further R and D and demonstration projects should be encouraged so as to expand further these options. The practical application of re-use will always be strongly dependent on local and regional circumstances, and also requires study in each case. Despite increased waste re-use in the immediate future, alumina plants will still need to rely heavily on well-engineered waste disposal methods;

(d) A closer harmonization of environmental standards and procedures around the world is desirable so as to reduce trade distortion. Project costing methodologies should include an estimate of environmental damage so as to achieve a total cost concept of alumina production;

(e) Corporate responsibility for environmental performance should be strengthened. Companies need to take a long-term view of environmental performance as well as paying attention to immediate impacts;

(f) Increased consideration needs to be given to interlinkages within the sector - vertical linkages within the aluminium industry as a whole so as to apply total-environment and life-cycle concepts, and horizontal linkages so as to maximize the contribution to environmental performance from suppliers and from waste re-use activities.

12. A general view from the discussion was that increased emphasis on information collection and dissemination concerning methods of reducing environmental impact would help many enterprises, especially those which are not linked with large vertically integrated companies.

II. LEATHER INDUSTRY

1. The Symposium on the leather industry was held on 15 October 1991. Members of the Panel were R. Higham (Consultant), Ms. G. Stoikov, International Labour Office (Moderator), J. Buljan, UNIDO (Rapporteur), R. L. Sykes, United Kingdom (Industry representative), A. Jernelov, Sweden (NGO) and R. Williams, UNIDO Secretariat.

2. Mr. Higham briefly summarized the case study and highlighted the main environmental issues.

A. Discussion

3. Technology: It was agreed that R and D had made great progress and that well-proven cleaner production methods are available. However, there still remains a number of barriers such as dissemination of information about cleaner technologies which are not always easily available to the tanning industry.

4. There is also the problem of transferring technology from the R and D laboratory into practical everyday use, especially in small- and medium-scale tanneries. Low-waste technologies very often require better skilled personnel at all levels and closer technical supervision than conventional processing. This is, in many instances, a crucial constraint. In a number of developing countries there is a lack of know-how in the design, installation, and efficient operation of effluent treatment plants.

5. Owing to the nature of leather production, even in the most sophisticated tannery, technology remains to a certain extent a mixture of craft and science. Nevertheless, unnecessary conservatism remains in some instances a significant barrier.

6. Financial aspects: The issue of cost and financing was discussed and there was a general consensus that cost constituted an obstacle to the implementation of clean and safe production of leather. Within this context the cost of specialty chemicals needed to replace conventional substances and the cost of process and water consumption control equipment were specifically mentioned.

7. In general, the cost of ecologically sound equipment is even more prohibitive in developing countries than in developed countries because of high capital costs and very often high import duties. In addition, there is the cost of hiring and training the personnel needed for the operation of new equipment and processes.

8. Sharing of responsibilities: There was a lively debate on how to share the responsibilities for preventing pollution and cleaning up. A special issue raised was the role of Governments, industries, R and D institutions, monitoring/ enforcement organizations, and consumers.

B. Recommendations

9. Delegates and industry experts summarized the most promising ways of reducing the negative environmental impact of the leather industry. It was agreed that the overriding principle is that prevention is better than cure, and that pollution prevention and waste management systems should be integrated at all levels. The following recommendations were made:

(a) Government and industry should cooperate in order to:

(i) Develop fair and implementable environmental legislation;

(ii) Promote cleaner and cost-efficient technologies at all stages of leather production and waste management (this could possibly include the relocation of tanneries, where appropriate);

(iii) Devise innovative fiscal and other incentives to encourage tanneries to use cleaner production and waste management methods;

(iv) Develop and/or strengthen R and D facilities to satisfy the specific needs of the local industry, and where possible, also install pilot and demonstration plants and laboratories;

(v) Launch environmental awareness and public education campaigns and provide the necessary training for executives, supervisors and operators;

(vi) Increase the use of environmental audits;

(vii) Provide the necessary infrastructural support (utilities, land, sewage, landfills for disposal of solid wastes, etc.).

(b) At the plant level the following measures requiring limited investment could lead to significant reduction of pollution loads:

(i) Strict process control;

(ii) Good housekeeping;

(iii) Recovery and/or recycling of chemicals;

(iv) Proper maintenance and repair of equipment;

(v) Introduction of sound management concepts.

Further measures to reduce the pollution load could include the utilization of waste of commercial value for the production of glue, gelatine, fertilizers, animal feeds, etc. However such operations are very often profitable only in large tanneries. The need for technical cooperation in setting up joint effluent treatment plants for groups of tanneries and isolated individual tanneries was also expressed. To ensure a healthy working environment for the benefit of all staff is the special responsibility of tannery management.

(c) International and relevant national agencies should:

(i) Facilitate the advancement of networking of global capabilities and programmes in the R and D institutions and provide access to relevant information at the national and international level;

(ii) Ensure the transfer of cleaner technologies and low-cost waste treatment systems by means of databases, audio-visual training packages, workshops, seminars, symposia, etc.;

(iii) Make available attractive financial terms (soft loans) and support from international institutions. This would overcome the disincentive to change caused by high initial investment. Such support should also be in the form of demonstration projects illustrating tannery partial and full automation, and include development of human resources;

(iv) Organize a special conference on low waste technologies for the leather industry in developing countries.

III. PHOSPHATE FERTILIZERS

1. The Symposium on phosphate fertilizers was held on 17 October 1991. Members of the Panel were J. Schultz (Consultant), R. N. Roy, Food and Agriculture Organization (Moderator), I. Volodin, UNIDO (Rapporteur), O. Lie, Norsk Hydro (Industry Representative), M. Handley, International Fertilizer Association Technical Committee (Industry Representative), J. H. Oxley and S. Luken, UNIDO Secretariat.

2. Mr. Schultz briefly summarized the case study and highlighted the main environmental issues.

A. Introduction

3. The importance of mineral fertilizers for agriculture cannot be underestimated. Fertilizer is one of the major inputs that enables adequate food production and maintenance of soil fertility on a sustainable basis.

4. There is no doubt that, without fertilizers, sustainable agriculture required to feed the world's growing population cannot occur and the most critical issue is not to stop fertilizer production, but to try to find ways and means, at the level of industry, to maintain ecologically friendly and sustainable production. In other words, how to achieve ESID in this subsector.

5. It is crucially important to identify the criteria for ecological sustainability in industry and agriculture. This has turned out to be a very challenging task. Every attempt brings out a number of issues that need to be addressed. In many respects, the scientific, financial, and political community has not been fully challenged to address the question of quantifying the complex relationships of these issues.

6. These issues are:

(a) The transfer and execution of ESID technology;

(b) The coupling of agronomic needs with more environmentally benign phosphate production technology;

(c) The seeking of financial resources to implement ESID;

(d) The restrictive fertilizer product legislation that inhibits implementation of ESID;

(e) The heavy metal content associated with the phosphate sector, especially cadmium;

(f) The management of process wastes and by-products associated with the phosphoric acid-based products;

(g) The improved agronomic efficiency to help mitigate the impact of the increased cost of ESID.

7. The Panel discussion identified the major barriers and proposed some initiatives for achieving ESID in the fertilizer industry.

8. A summary of these barriers, with no reference to priority or importance, follows:

(a) Lack of definition of acceptable minimum global environmental standards;

(b) Cost required to implement available and emerging ESID technology;

(c) Major investments required to change product mix (product types and solubility);

(d) Limited availability of foreign exchange;

(e) Marginal competitive status within the phosphate fertilizer industry;

(f) Lack of significant farm level cost differences between conventional and more environmentally benign products;

(g) Restrictive fertilizer product legislation;

(h) Difficulty in changing farmers' practices.

B. Recommendations

9. The following recommendations emerged from the work of the symposium:

(a) Encourage the international community to convene an international working panel of experts from industry, national and international regulatory bodies, and the scientific community to draft proposed minimum environmental compliance standards for the phosphate fertilizer production sector appropriate to country location, taking into consideration scientific data, costs, available capital, and national development priorities. Similar initiatives should be taken in regard to phosphate fertilizer use;

(b) Initiate a critical scientific look at issues related to cadmium, fluorine and other potentially hazardous substances occurring in the production and use cycle of phosphate fertilizers taking into consideration other contributive sources;

(c) Communicate industry and process-specific engineering and operational technology to producers in developing countries that is designed to achieve ESID, through optimization and retrofitting of existing facilities at low cost as opposed to total replacement of facilities at high capital cost;

(d) Develop an implementation timetable on a national basis for attaining ESID consistent with the availability of capital and the operation of the industry in a competitive, yet sufficiently profitable manner;

(e) Provide assistance in securing the necessary capital for cost-effective implementation of identified ESID initiatives;

(f) Encourage the industrial community to intensify its commitment to R and D designed to expedite technology development and technology transfer leading to ESID;

(g) Improve phosphate fertilizer use efficiency at the farm level to help offset the increased cost of phosphate fertilizers that is likely to be attributed to ESID;

(h) Promote national fertilizer legislation relative to product types and characteristics that is consistent with achieving the appropriate agronomic performance, while not unduly restricting raw material and manufacturing choices that may facilitate more rapid adoption of ESID;

(i) Encourage national policy initiatives relative to fertilizer pricing and distribution that promotes the local production of more environmentally benign fertilizer products based on domestic resources, provided these alternative products are competitive in real terms with imported products that are produced in world-scale production units.

C. Discussion

10. As a result of the presentation by the Panelists and the summary drawn up by the Moderator, a consensus was evident with regard to the technical content of the case study. The delegates, however, focused their attention on a number of specific issues with particular reference to the following:

(a) There is no substitute for phosphate, any reduction of its use would result in the reduced production of food, fibre and edible oils;

(b) Concern was expressed regarding the lack of representation of bodies concerned with public opinion on environmental issues;

(c) Cadmium and other heavy metals were identified as a major concern affecting the production, trade and use of phosphate raw materials and products. The concern is related to their impact on human and animal health through the food chain;

(d) Fluorine contained in phosphate fertilizer raw materials and products was identified as a potential contaminant of surface and groundwater;

(e) Concern was voiced that less beneficiated (pure) phosphate products considered more environmentally benign may actually contribute to increased levels of undesirable metals in the finished phosphate products;

(f) Concern was raised that reclamation at mined-out lands may be excessively costly in certain mining scenarios;

(g) An issue was raised relative to the feasibility of incorporating phosphogypsum disposal with the reclamation at mined-out areas;

(h) A number of delegates indicated that relatively extensive research is already under way for finding cost-effective methods for removing cadmium, fluorine and other potentially hazardous elements from phosphate materials;

(i) Concern was expressed about the need for immediate assistance in technology transfer to developing countries to achieve ESID. To this effect, it was suggested that a special fund should be created;

(j) Concern was expressed with regard to the disposal of fluosilicic acid recovered from phosphate processing in those locations where markets for this by-product material do not exist;

(k) It was mentioned that bentonite when added to sandy soils improves moisture-holding capacity and fertilizer use efficiency. Immobilization of cadmium was also suggested due to the betonite;

(l) Concern was voiced with regard to the problems that would be caused by unilateral environmental legislative initiatives;

(m) There was significant support for the concept of using less soluble phosphate fertilizers provided they are effective;

(n) Concern was expressed about the very high level of SOx pollution from a few plants in developing countries representing a very high proportion of industry's worldwide SOx pollution in addition to being a serious regional source of pollution.

IV. PLASTICS AND PLASTICS WASTE RECYCLING

A. Introduction

1. The Symposium was to be held on 17 October 1991, but by request of the Italian delegation a preliminary gathering was held on 15 October 1991. Members of the Panel were Prof. A. Buekens (Consultant), A.Sieber, Economic Commission for Europe (Moderator), Ms.A.Tcheknavorian-Asenbauer (Director, IO/T, UNIDO), J. H. Oxley (Rapporteur) UNIDO, and D. Rehling (European Environmental Bureau) and R. Williams, UNIDO Secretariat.

2. The case study was summarized by Prof. Buekens who pointed out various technical and economic challenges to be met. Plastics belong to various mutually incompatible generic groups. Each variety is manufactured in numerous grades with different molecular weight and structure. Moreover, plastics are transformed only after admixture of a host of different additives. A first challenge is hence identification of a particular grade that can be recycled as a more or less homogeneous function.

3. During processing and later use the resin undergoes ageing, as a consequence of thermal degradation, oxidation, cross-linking, loss of additives, etc. Plastics also take up impurities, such as traces of materials e.g. moisture and printing inks.

4. A survey was given of various methods of materials recycling, including those after chemical reprocessing (pyrolysis, hydrolysis) and energetic usage.

5. Technically speaking, many problems have been solved. The logistics of collection and transportation, the required grading, shredding, cleaning, regranulation and marketing greatly add to the cost of secondary plastics, whereas their quality goes down.

B. Recommendations

6. It is suggested that Governments:

(a) Take the initiative to foster the development by industry of appropriate and internationally standardized means of identifying the type of plastic used in a product (e.g. by adding trace amounts of fluorescent additives);

(b) Encourage the production and use of utilitarian products (e.g. park benches, acoustic walls, fences) which can be made from recycled plastics out of mixed consumer waste;

(c) Should ban uncontrolled, unhygienic forms of scavenging in developing countries and encourage systematic collection at the source (e.g. households).

7. It is suggested that industry:

(a) Should, as far as possible, avoid using more than one type of plastic for a given article;

(b) Should develop products which can be made from recycled plastics composed of two or more commingled types;

(c) Should develop the production of plastic goods which are easily recycled;

(d) Should assume responsibility for the products it takes to the market with inclusion of all environmental and safety aspects.

8. It is suggested that international organizations, such as UNIDO:

(a) Should be encouraged to continue providing technical assistance aimed at improving the efficiency of plastics transformation industries in developing countries, so as to improve the performance and life of plastic articles, thus avoiding waste;

(b) Should promote the creation of small industries in developing countries to make maximum use of secondary raw materials, in particular plastics contained in the waste stream.

C. Discussion

9. In the case study and the following discussion considerable attention was given to the huge technical and economic barriers to be overcome:

(a) The great variety of plastic resins, grades and additives in use defies precise identification and sorting;

(b) The decrease in mechanical properties as a consequence of ageing, thermal degradation during reprocessing, photochemical degradation, oxidation, cross-linking, loss or consumption of stabilizing additives and antioxidants, etc;

(c) The uptake of contaminants, such as traces of packed materials, moisture, inks, solvents, etc;

(d) The lightness and widespread use of post-consumer waste makes it a challenge to retrieve sizeable amounts of waste plastics at a reasonable cost;

(e) The variable and ill-defined specifications of reclaimed plastics.

10. The cost of collection, identification, sorting and grading, shredding, cleaning, regranulation, processing and marketing was noted to be higher than for virgin plastics, taking into account the decreased productivity obtainable with reclaimed plastics as a consequence of their variable melt and flow behaviour. During the discussion the necessity of marking plastics was stressed. The need for industry to

use technical and business ingenuity in developing the plastics production transformation and recycling industries, as well as in the packaging industry, so as to minimize unrecyclable waste was also mentioned.

11. Attention was paid to:

(a) Governmental measures to encourage or even to enforce recycling quotas;

(b) The economic incentives to promote recycling activities despite large fluctuations in the cost of virgin materials;

(c) The viewpoints of collecting and recycling firms;

(d) The growing sense of responsibility in some branches of industry (car manufacturers) in order to favour recycling of spare parts or plastic materials.

V. PULP AND PAPER

A. Introduction

1. The Symposium on pulp and paper was held on 14 October 1991. Members of the Panel were J. Fellegi (Consultant), Nay Htun, UNCED (Moderator), R. V. Assumpcao, UNIDO (Rapporteur), Prof. N. Hartler, Royal Institute of Technology, Sweden (Industry representative), Margaret Rainey, Greenpeace International, and R. Williams, UNIDO Secretariat.

2. Mr. Fellegi briefly summarized the case study and emphasized the main differences between developed and developing countries with regard to fibrous raw materials used for pulping, economic conditions, and the level of technology. He also reviewed the impact of these differences on the environmental situation and barriers on the road to an ecologically sustainable development in this industry. The UNIDO representative outlined that Organization's activities aimed at improving the environmental situation and proposals for future activities.

3. Industry experts reached the following conclusions based on the case study:

(a) Sustainability must be judged in a broad sense considering the product "from cradle-to-grave";

(b) Wood is a dominating raw material and in the large producing countries it is managed on a sustained basis;

(c) Large-scale modern pulp and paper manufacturing has been greatly improved, resulting in a potential for producing pulp and paper with minimal environmental disturbance. In developed countries,very large investments have already been made in the industry and more are planned. In mills that are small and old and use non-wood fibres, there is significant scope for improving the environmental situation;

(d) The subject of whether to totally exclude molecular chlorine and possibly chlorine dioxide in pulp bleaching is still open;

(e) Emission to air of acidifying gases can be greatly reduced by modern technology;

(f) In the case of chemical pulping it is possible to produce all energy required internally and also to produce some surplus with low emissions of acidifying gases;

(g) The product "paper" is environmentally friendly. It is produced from renewable raw materials and is biologically degradable. By applying new technologies it is possible to produce bleached products with dioxin content at the same level as for unbleached pulp;

(h) There is today a considerable move to expand use of recycled paper in traditional fields. All fibres cannot be recycled for reasons of fibre quality as well as hygiene. The non-recycled part of waste paper should be used for energy production, with no disturbance of the global carbon dioxide balance.

B. Recommendations

4. To overcome barriers, Governments are requested:

(a) To introduce environmental standards, if not yet established;

(b) To enforce such standards and to support the introduction of clean technology by tax incentives;

(c) To reduce or to abolish existing import duty on waste paper and equipment for clean technologies;

(d) To introduce charges for pollution and use the collected funds for subsidizing clean production technologies in the pulp and paper industry.

5. Industry is advised:

(a) To improve management, housekeeping and engineering, by reducing the environmental impact of production, especially by accidental discharges;

(b) To reduce water and energy consumption in pulp and paper making;

(c) To introduce internal environmental monitoring and auditing;

(d) To consider reduction of chlorine in the bleaching process;

(e) To cooperate with national and international organizations in developing indigenous clean technologies or by adapting foreign know-how to local conditions;

(f) To consider, in developing countries, the possibility of grouping small pulp mills to recover the chemicals from black liquor;

(g) To improve, at all levels, management and technical skills in the mills in cooperation with the Government and international organizations.

6. International organizations are requested:

(a) To intensify the flow of information on clean technologies between countries;

(b) To promote research and development of technologies for pulping, small-scale chemical recovery and bleaching with regard to non-wood materials such as:

(i) Sodium-oxygen, potassium hydroxide, soda antraquinone, organosolv pulping;

(ii) Chlorine-free bleaching using oxygen, oxone, hydrogen peroxide as well as biobleaching;

(iii) Alternative processes for small-scale chemical recovery and utilization of black liquor;

(c) To disseminate know-how gained under UNDP/UNIDO projects regarding treatment of black liquor and effluents;

(d) To provide assistance to institutions in developing countries to develop indigenous technologies for clean production and further the cooperation between industry and such institutions world wide.

7. The representative of Greenpeace International presented a statement with the following recommendations:

(a) In order to achieve ESID, the discharges of organochlorine compounds should be phased out through the use of clean production methods, i.e. phase out all chlorine-based bleaching;

(b) To increase recycling of waste paper by at least 5 per cent per year to achieve a global recycling rate of 50 per cent by the year 1995;

(c) To prohibit all forestry practices that cause biodiversity reduction. Pulp producers should install a biodiversity monitoring programme in all forests where wood is extracted.

C. Discussion

8. It was stressed that the most important barrier to introducing ESID in developing countries is finance. There are still technical and economic barriers to achieving ESID when using non-wood raw materials, especially in small mills. Another barrier is lack of technical skills and education.

9. Other considerations were:

(a) Good housekeeping and engineering practices, e.g. avoiding accidental discharges of polluting substances, good management of wastes, optimizing raw material utilization and life-cycle approach (cradle-grave) are significant steps in achieving clean production;

(b) Emerging trends in pulping, washing of pulp, chemical recovery and bleaching, e.g. use of potassium hydroxide instead of sodium hydroxide, simplified chemical recovery, etc;

(c) Waste paper should be recycled and new environment friendly printing inks should be used;

(d) The problem of completely chlorine-free bleaching was discussed and mention was made that production of high brightness pulp without chlorine compounds is at the present time not realistic. However, lower whiteness paper can be produced by using pulps bleached with a low chlorine charge or without chlorine, if acceptable to consumers.

10. It was suggested to complement the case study by adding current statistics on pulp production and processes giving details of developed and developing countries.

Annex II

DOCUMENTS SUBMITTED TO THE CONFERENCE

Document symbol	Title of Document
ID/WG.516/12	Provisional Agenda
ID/WG.516/12/Add.1	Annotated Provisional Agenda
ID/WG.516/11	Draft Rules of Procedure for the Conference on Ecologically Sustainable Industrial Development (ESID)
ID/WG.516/2	Issues in Support of Ecologically Sustainable Industrial Development
ID/WG.516/9	Draft Conclusions and Recommendations
	Working Papers
ID/WG.516/7	The Road to Ecologically Sustainable Industrial Development. Working Paper 1
ID/WG.516/1	Barriers Facing the Achievement of Ecologically Sustainable Industrial Development. Working Paper 2
ID/WG.516/6	Industry Initiatives in Achieving Ecologically Sustainable Industrial Development. Working Paper 3
ID/WG.516/5	Government Initiatives in Achieving Ecologically Sustainable Industrial Development. Working Paper 4
ID/WG.516/3	International Cooperation in Achieving Ecologically Sustainable Industrial Development. Working Paper 5

Case Studies

ID/WG.516/4	Pulp and Paper. Case Study No. 1
ID/WG.516/4/Summary	Pulp and Paper. Case Study No. 1 - Executive Summary
ID/WG.516/8	Alumina Industry. Case Study No. 2
ID/WG.516/8/Summary	Alumina Industry. Case Study No. 2 - Executive Summary
ID/WG.516/10	Leather Industry. Case Study No. 3
ID/WG.516/10/Summary	Leather Industry. Case Study No. 3 - Executive Summary
ID/WG.516/14	Phosphate Fertilizers. Case Study No. 4
ID/WG.516/14/Summary	Phosphate Fertilizers. Case Study No. 4 - Executive Summary
ID/WG.516/15	Plastics and Plastics Waste Recycling. Case Study No. 5
ID/WG.516/15/Summary	Plastics and Plastics Waste Recycling. Case Study No. 5 - Executive Summary

Information documents

ID/WG.516/13	Report of the Meeting of Senior Governmental Experts for the Preparation of the Conference on Ecologically Sustainable Industrial Development
ID/WG.516/16	List of Documents
ID/WG.516/INF.1	Advance Information for Participants